Governance and Reform in the Healthcare System: Key Challenges and Perspectives

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ABSTRACT

BACKGROUND

Modern transformations in the system of socio-economic relations necessitate the reformatting of management models, emphasizing publicity, transparency (the principle whereby the activities of governing bodies (governmental, commercial, or public) are open, and their decisions and decision-making processes are accessible to the public), and accessibility of information. These processes are particularly important in the healthcare sector, where effective public administration directly affects the quality and efficiency of medical services.

MATERIALS AND METHODS

The study mainly involved a systematic and comprehensive analysis of scientific publications, research papers, and key global security trends based on industry statistics. The study employed analytical and comparative methods to examine modern aspects of public administration in healthcare in the context of ongoing reforms and contemporary challenges. Practical cases from developed countries were analyzed to identify successful management strategies, as well as legal and organizational mechanisms that could serve as a basis for improving governance in the medical sector.

RESULTS

The study identified the main achievements of healthcare management modernization and the impact of digitalization on management processes, outlining key reforms such as the introduction of innovative electronic systems and technologies that improve operational efficiency. In addition, key security challenges were identified, including the protection of confidential data, prevention of unauthorized access, and maintenance of information integrity. Comparative analysis has been strengthened, specific threat models, mitigation measures, and policy levers have been provided. Models of public-private partnerships in healthcare have been refined, and the main results, risks, and regulatory acts in the field have been presented.

CONCLUSION

The study emphasizes the need to continue reforming healthcare management to ensure greater efficiency, quality of medical care, adequate funding, improvement of sectoral legislation, and harmonization with European standards. Strengthening digital governance and information security remains a priority for the development of a sustainable healthcare policy.

Keywords: Administration, efficiency, Electronic medical record, Healthcare policy, Healthcare system, Public administration, State management

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Highlights

- Emphasizes the central role of public administration in improving healthcare quality and accessibility.
- Highlights the importance of transparency and public engagement in strengthening healthcare governance.
- Analyzes the impact of digitalization and artificial Intelligence (AI) on optimizing healthcare management systems.
- Identifies key security challenges in protecting medical data and ensuring information integrity.
- Suggests developing Public-Private Partnership (PPP) projects and digital tools to enhance efficiency and reform implementation in healthcare.

Introduction

Within the framework of modern trends in socio-economic development, the healthcare sector is a priority area for the transformation of management processes. All aspects of regulation are undergoing changes–from the ideological basis of the provision of medical services to financial, economic and market mechanisms.

The problematic aspects of modern concepts of public administration in the field of health care are reflected in scientific discourse in a multidisciplinary context. Numerous scientists[1,2] devote scientific investigations to the study of opportunities for optimizing medical management against the background of digitalization and the dynamics of views on management functionality, as well as practical cases related to their implementation. The publications of Madan and Ashok,[3] Simonet[4] update the goals, means and transformed communication between participants in the process of providing medical services. The authors emphasize the principles of humanism and anthropocentrism, as well as the right of autonomy in decision-making by the consumer of services.

Among the key achievements of medical reform, it is necessary to highlight the growth of the share of private practice, optimization of financing and logistics of patients between individual medical sectors. At the same time, a number of issues regarding the effective management of healthcare institutions in the context of digitalization, guarantees of inclusivity, and accessibility of medical services remain insufficiently researched and still need to be resolved. Effective use of resource potential, increasing the efficiency of its implementation in the area under study, can be achieved under the condition of effective sectoral public administration.

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The purpose of the research is an extended analysis of key contemporary aspects of public administration in the healthcare sector in the context of popular reforms and current challenges.

Literature Review

Scientists who developed a system of analytics and evaluation of healthcare functions,[5–7] investigated the potential for effective personnel policy in the studied area,[8–10] and emphasized the significance of supporting the competitive advantages of medical institutions.[11,12] The authors identified the influence of the state on the development of individual segments in the healthcare sector and emphasized the need for an effective system for protecting patient rights.

The possibilities of adapting modern digital transformation tools in the healthcare sector were investigated by Khatoon,[13] Klochan et al.[14]; the scholars found that modern medical support platforms and electronic document management should function as a single hub for all areas of services, which will optimize time resources, reduce corruption risks, and allow for better results in the functioning of the medical system.

Individual elements of public governance in the industry are considered in the study by Chen et al.,[15] Klenk and Reiter,[16] Kraus et al.,[17] where the authors emphasize the need to guarantee citizens' medical rights in the process of transforming the healthcare sector, and also promote narratives of unification of standards as the basis for sustainable and inclusive social development.

Ahn and Chen,[18] MacLean and Titah[19] identified specific prerequisites for the effectiveness of sectoral management in the area under study, including the availability of resources and the willingness of participants in the process of providing medical services to upgrade the traditional system.

The results of the scientific studies of the mentioned authors do not allow achieving comprehensiveness and systematicity in the formation of concepts of public administration in the field of health care, which actualizes the need for further examination of various aspects of this issue.

Materials and Methods

The type of article is a narrative review. The study mainly involved a systematic and comprehensive analysis of scientific publications, research papers, and major global security trends based on industry statistics. To ensure transparency and reproducibility, full Boolean search strings were prepared for each database, the exact date of the last search is reported, and language restrictions were applied.

The analytical synthesis followed a thematic method, which enabled the systematic identification, codification, and integration of recurrent conceptual patterns across the selected studies. A coding framework was developed iteratively, allowing the classification of findings into domains related to public administration strategies, digital governance mechanisms, interoperability development, and sectoral reform outcomes. To reduce internal bias in the publications used for this study, an open access and data reuse strategy was employed. This involved providing access to the full study data, allowing the results to be verified and further analysis to be conducted if necessary, thereby reducing the impact of bias.

Non-applicable technical elements were excluded to maintain conceptual alignment with narrative and thematic review standards. This ensured that the synthesis concentrated strictly on governance-relevant evidence and cross-study thematic convergence.

The main materials for the study were selected industry publications indexed in leading scientific databases (Web of Science, Scopus), as well as statistics from official sources. The sample period was 2019–2025. Search engines such as Google Scholar were used to effectively find information during the study. Queries were formulated by selecting relevant keywords, and clarifying questions or commands were used to narrow down the search results. For a more in-depth analysis, results from various sources were reviewed, paying attention to the quality of the information. The criteria for inclusion and exclusion of publications were spatial and temporal indicators and the level of reliability of the information. The criteria for assessing the quality of sources were the relevance and objectivity of the publication, the completeness of the coverage of the topic, and the authority of the source.

Aspects of critical evaluation of research included verification of: relevance, novelty, and significance of the problem; compliance of the chosen methodology with the goals and objectives of the study; reliability and validity of results; logical soundness of conclusions and compliance with scientific standards, as well as potential implementation in practice.

Systematic Review Protocol

Search Databases

To conduct a systematic review, a search was conducted in the scientific databases Web of Science, Scopus and additionally through Google Scholar. The search was conducted on July 1, 2025. The publication restriction was set for the period 2019–2025. The language selection criteria were English and Ukrainian.

Full Search Series

For effective information retrieval during the study, search engines such as Google Scholar were used. Queries were formulated by selecting relevant keywords, and clarifying questions or commands were used to narrow down the search results. For a more in-depth analysis, results from various sources were reviewed, paying attention to the quality of the information.

Search strings are phrases that were entered into search engines (Google Scholar) to find scientific information and research results. An effective search query for research involved identifying keywords: basic terms related to the research topic; synonyms and related terms to cover a wider range of sources; specific terms (names of methods, authors, terms, etc.). The keywords for the search were "security, security management, psychological aspects, resilience, cyber threats, privacy," as well as related and synonymous terms.

The date of the last search was July 2025. The number of records obtained in the databases was: Web of Science – 15, Scopus – 23.

Boolean Search Strings

Web of Science

("healthcare" OR "medical system" OR "public administration") AND ("digital health" OR "eHealth" OR "electronic health record" OR "AI in healthcare") AND ("Ukraine" OR "comparative study")

Scopus

TITLE-ABS-KEY(("healthcare" OR "medical management") AND ("digitalization" OR "telemedicine" OR "electronic health records") AND ("Ukraine" OR "public-private partnership"))

Google Scholar

allintitle: "healthcare management" AND "digital transformation" AND "Ukraine".

Eligibility Criteria and Quality Appraisal

To ensure methodological consistency and transparency, explicit eligibility criteria were defined before the review process. The inclusion of publications was based on spatial and temporal parameters, thematic relevance, and the reliability of presented evidence. The following criteria guided the selection of sources:

- Study design: empirical studies, systematic and scoping reviews, policy analyses, and applied case studies in the fields of public administration or healthcare management.
- Thematic scope: research examining the functioning of healthcare institutions, governance mechanisms, digital health implementation, or national-level health management systems.
- Geographical relevance: studies focused on Ukraine or those enabling cross-national comparisons with countries (Germany (social market economy), the United Kingdom (NHS public system), Canada (mixed system), and Australia (mixed system)) demonstrating comparable governance models or trajectories of digital health development.
- Outcomes of interest: findings related to the effectiveness of health system management, digital transformation processes, interoperability and e-health infrastructure development, or results of administrative reforms.
- Language and publication period: peer-reviewed sources published in English or Ukrainian between 2019 and 2025.

Exclusion criteria included:

- Lack of full-text access;
- Opinion articles, editorials, or non-verifiable materials;
- Studies limited solely to clinical or biomedical procedures without managerial or governance relevance.

A structured quality appraisal was conducted using an established critical evaluation tool (e.g., JBI, MMAT, or CASP) selected according to study design. Each publication was assessed in terms of methodological validity, internal coherence, and evidentiary credibility. Only works meeting a minimum quality threshold were retained for synthesis. A consolidated summary of study characteristics and appraisal results is presented in Table A1.

Search Results and Pre-Selection Screening Flowchart

A summary of the literature search and screening results by database is presented in Table 1.

The general screening flowchart can be presented as follows (Figure 1).

Critical Evaluation Tools and Results

Critical evaluation tools included methods for verifying accuracy, analyzing sources, assessing relevance, and research methods. Internet search rules were applied, as well as analysis of the text for emotional words and manipulative headlines. An analysis of information sources was conducted: the authority and reliability of the source were assessed; attention was paid to the relevance of the information: whether it was still relevant. In addition, research methods were evaluated, which involved a critical approach to the methods used to obtain the information.

The Data Extraction System Included

- Data collection, preliminary processing: sentences and words are selected, normalization and stop word removal are performed;

Table 1 | Summary of literature search and screening results by database

Database	Records Identified	Records After Duplicates Removed	Records Included After Screening
Web of Science	15	14	7
Scopus	23	20	10
Google Scholar	12	12	5

Source: author's development.

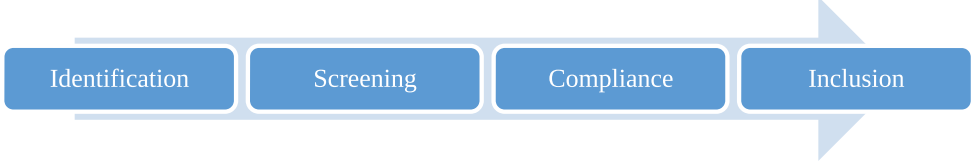

Fig 1 | General screening flowchart
Source: Author's development

- Selection of entities that are significant in the context of the study;
- Extraction of relationships between selected entities;
- Structuring of information.

In general, the methodology for selecting studies was consistent with the PRISMA diagram (Figure 2).

The methodological and theoretical basis of the research was formed taking into account the priority principles of implementing systemic studies, based on a comprehensive approach. The article selection process was carried out in accordance with the PRISMA 2020 recommendations. The following data were selected for analysis: study characteristics, methodology, population, intervention, outcomes, and key findings.

Many theoretical research techniques were employed to completely reveal the problems, including abstract logical and comparative analysis, abstraction, induction, and deduction, as well as methods of specification and formalization, among others.

Methods of abstract logical analysis, as well as synthesis, were used to identify the most significant aspects and basic concepts of the phenomenon under study. The dialectical method, comparison and generalization were used to detail the system of definitions, identify basic categories and theoretical generalizations, and form a concept of a holistic process of public administration in the medical field. Comparative analysis was used to identify the stages and factors of development of the public administration system in the studied field. The inductive method was applied to predict development indicators. The deductive method was used to develop proposals for optimizing management processes in the medical field.

The specification method was used to measure the feasibility of updating and upgrading the role of public governance in implementing medical reforms. Along with this, with the help of the specification, optimal solutions and necessary prerequisites for optimizing

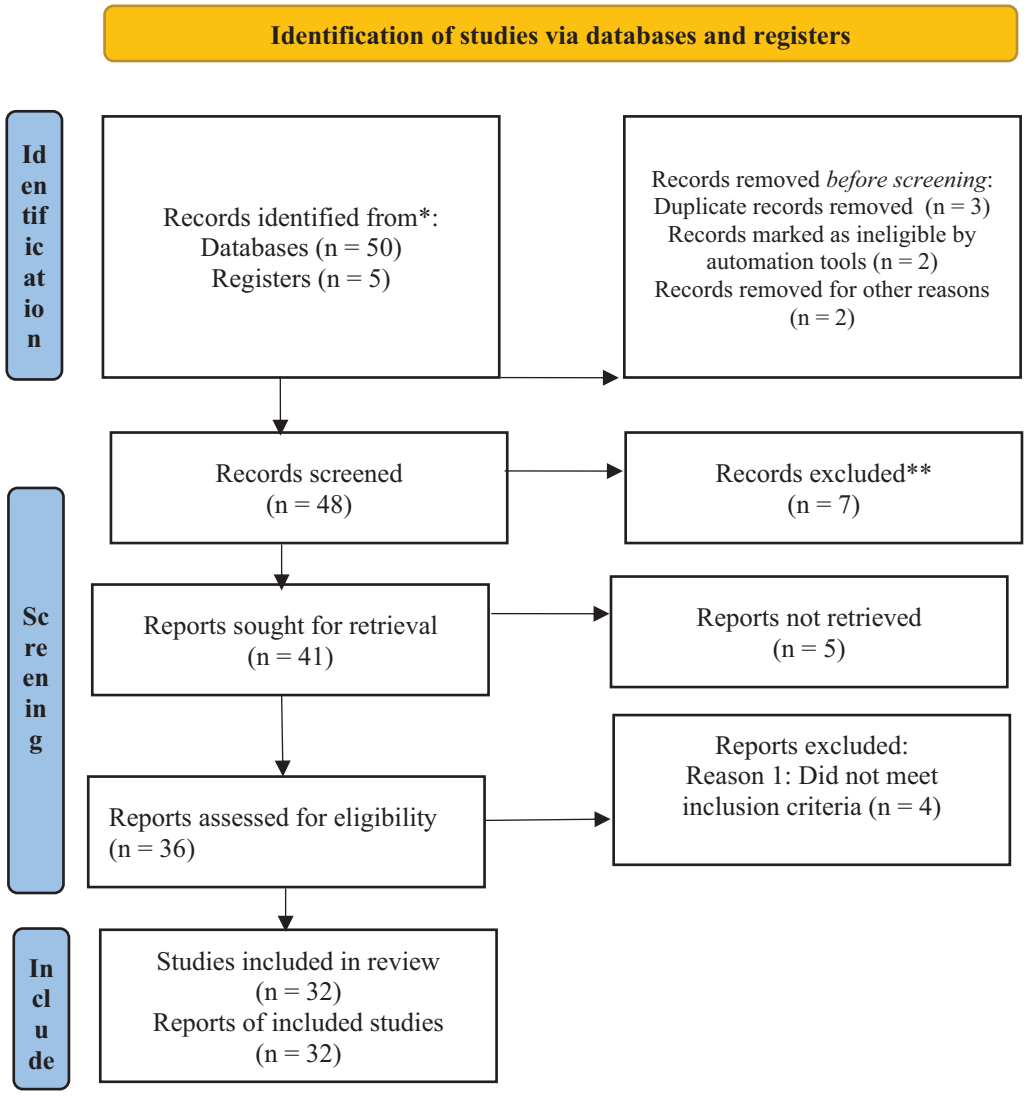

Fig 2 | PRISMA flow diagram used in the study (adapted from PRISMA 2020).
Source: Author's development

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the medical management system and mitigating related risks were identified.

The formalization method was used to identify key vectors for improving the public administration system in the health services sector in synergy with the conceptual principles of sustainable development, as well as to develop directions for the practical implementation of the results obtained in sectoral public administration, structuring the principles, priorities and functionality of the research object.

The limitations of the study are due to the complexity of experimentally verifying theoretical conclusions. To reduce the impact of bias and obtain more objective and reliable results, methods of minimizing bias were applied, in particular: increasing transparency (providing complete information about the research methodology and data analysis process with the possibility of replicating the results); limiting the influence of cognitive biases; adherence to ethical considerations; use of automated data analysis tools to reduce the influence of researcher subjectivity on the analysis process.

Results and Discussion

The need to optimize state administrative policy in the field of health care is due to the lack of a single strategy and the inconsistency of generally accepted global requirements for the quality of medical services with practical realities. State management in the field is primarily responsible for planning, organizing and monitoring the provision of medical services, conducting effective personnel policy, and integrating modern digital tools and information systems. The necessary conditions in this regard are depoliticization, partnership between the state and the public, prioritization of consumer interests and a focus on continuous improvement of the quality of services.

The practical experience of developed countries makes it possible to identify the advantages and disadvantages of the most representative models of healthcare system management. In particular, in Japan, the influence of local authorities prevails, and the characteristic features of management are strict control over the quality of services and large-scale state financing. At the same time, in the United States, the rapid development of private health insurance has caused financial imbalances in the healthcare system.

In German practice, public administration is focused on ensuring the accessibility and quality of medical services, the active implementation of innovations and personnel policy. The experience of Great Britain is considered representative, where the key principles of sectoral public management are the accessibility of medical services and effective resource allocation. France, which occupies a leading position in the World Health Organization's (WHOs) ranking of health care management, ensures universal coverage of the population with medical services and focuses its efforts on maximum patient satisfaction, combining public and private practice. In general, the management systems of the studied industry in countries with a high level of socio-economic development are characterized by the dominance of private practice and state guarantees of a minimum package of medical care.

For developing countries, general market approaches to the formation of a package of medical services remain a priority, which actualizes the mechanisms of Public-Private Partnership (PPP) to protect vulnerable social groups and meet the needs of the population with a high level of socio-economic well-being. Today, it is obvious that PPP projects in the medical sector make it possible to significantly improve the quality of services and expand their range, integrate international quality standards, and guarantee the availability of medical care.

Integrating efficient digital systems and cutting-edge artificial intelligence (AI) capabilities is another crucial strategy for changing public administration in the healthcare industry. The creation of electronic document management systems and the formation of a national observatory of human resources will allow not only to effectively collect, accumulate and process informative data, but also to provide a system for supporting management decision-making.[20,21]

The creation of a digitalized register of medical specialists, the prolongation of education and training of doctors, and cooperation with international organizations will allow for a gradual transition to an optimal system of medical staff ratio in the health care system. The main areas of influence of innovative technologies on public administration processes in the health care sector are specified in Table 2.

Today, several methodologies are used worldwide to assess the development of e-health, each based on the study of different indicators. For example, The Health Care Index is a statistical analysis of the overall quality of the healthcare system, including healthcare infrastructure, the competence of healthcare professionals, cost, access to quality medicines, and government readiness. The top three countries in the 2023 Health Care Index ranking are Asian countries (Taiwan, South Korea, Japan), with Ukraine ranking 75th.[22]

The Global Health Security Index (GHSI) is designed to assess a country's technical, financial, socio-economic, and political capabilities to prevent, detect, and respond quickly to epidemic threats with international

Table 2 | Digitalization of public administration in the field of healthcare

Vector	Practical Tools
Unified digital solutions – Electronic healthcare system (ECHS)	• CREATION of unified electronic patient databases; • introduction of electronic declarations; • Electronic prescriptions and referrals; • Backup, cloud storage; • Medical records and reports
HR policy	• Digital recruiting; • Staff upskilling; • Digital management systems
Privacy protection	• Multi-level authentication; • Verification of medicines; • Personal data protection systems

Source: developed by the author.

implications, whether natural, deliberate, or accidental. The GHS assesses countries across six categories (prevention of pathogen emergence or release, early detection and reporting of epidemics, rapid response to epidemics and mitigation of their spread, adequate and reliable health system, compliance with international norms, overall risk environment and country vulnerability to biological threats), 37 indicators, and 171 questions. According to the 2021 index, the United States, Australia, and Finland top the ranking. Ukraine ranks 83rd, up two places from 2019.

The Global Digital Health Index (GDHI), developed in early 2016, is an interactive web resource designed to track, monitor, and evaluate the enabling environment for eHealth around the world, control and evaluate the use of digital technologies in healthcare in different countries using the eHealth Strategy Toolkit of the WHO and the International Telecommunication Union. In 2022, the GDHI underwent an annual review of its indicators, as well as a redesign process to align the indicators with the WHO Global Digital Health Strategy as a supplement to the WHO Digital Health Atlas and now includes a greater focus on AI, gender issues, and health service coverage.[23] The name of the index was changed to Global Digital Health Monitor (GDHM) to articulate the value of the tool in providing a platform for monitoring eHealth progress at the national, regional, and global levels. The tool consists of 23 indicators in the areas of leadership and governance; strategy and investment; legislation, policy, and compliance; workforce; standards and interoperability; infrastructure; services; emerging technologies; and equity.

International experience shows that in conditions of resource scarcity, digital technologies become an important component on which the healthcare sector can rely to achieve effective results. According to the GDHM 2023 assessment, Ukraine scored four points (on a five-point scale). The country has accumulated positive experience in implementing tools and services that use information and communication technologies for prevention, diagnosis, treatment, monitoring, and management of health and lifestyle, which has improved the quality of patient care and brought the industry into line with international standards. This proves that Ukraine's healthcare sector is experiencing rapid growth, focusing on the development of such state mechanisms for e-health development as telemedicine and health monitoring.[24,25]

Key industry laws, regulations, and technical recommendations include the Law of Ukraine on Personal Data Protection; National Health Service of Ukraine (NSZU)/Medical Guarantee Program (MGP); National Electronic Healthcare Architecture (ESOZ)/eHealth architecture specifications; national cybersecurity requirements; PPP laws, concession rules, and procurement guarantees. Interoperability standards such as Health Level Seven (HL7) v2/Fast Healthcare Interoperability Resource (FHIR), Digital Imaging and Communications in Medicine (DICOM), and International Classification of Diseases (ICD)/Systematized Nomenclature of Medicine (SNOMED) enable the exchange, management, and integration of medical data between different systems and organizations. HL7 (v2 and FHIR) is used for the exchange of administrative and clinical data, DICOM for medical images, and ICD/SNOMED for the coding and categorization of diseases and medical procedures.

Overview of Standards

HL7

HL7 v2 One of the most widely used standards, used for messaging between systems such as scheduling systems (SIU), laboratory systems, and hospital management systems.

HL7 FHIR

A newer and more flexible standard that uses web technologies (REST, JSON) for integration and access to clinical data. It is designed for more modern information exchange.

DICOMA

standard for storing, transmitting, and printing medical images and related information. It ensures compatibility between different devices, such as X-ray machines, MRI, CT, and radiologist workstations.

ICD and SNOMED

ICD: Used to code diseases, injuries, and causes of death for statistical purposes.

SNOMED CT

A more detailed and comprehensive medical terminology system that includes a wide range of concepts such as diseases, procedures, symptoms, medical devices, etc. SNOMED CT is used for clinical documentation and is more detailed than ICD.

Key Aspects of Digitalization

1. Electronic health system (EHS): creation of a unified network to connect patients and medical institutions, allowing for process automation, improved access to services, and increased efficiency.
2. Electronic medical records: creation of a unified patient database that provides quick access to medical history, reducing paper bureaucracy.
3. Electronic prescribing: the ability to write and redeem prescriptions for medications, including prescriptions for medical cannabis, simplifying the process of obtaining medications.
4. Digitization of management processes: optimization and automation of all aspects of a medical facility's activities, from logistics to data analysis for management decision-making.
5. Development of telemedicine: interaction between doctor and patient using digital tools, which removes communication barriers and provides access to remote consultations.
6. Analytics and AI: use of large data sets for forecasting, analysis of treatment outcomes, and implementation of new automated solutions.

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7. Online government services: the ability to submit declarations to a doctor online, as well as the digitization of processes for rehabilitation services and drug verification.

Threat models for healthcare systems include: information threats (arising from the use of medical information systems (MISs) and e-health systems, which require the protection of patient data from unauthorized access), system failures (possible malfunctions of medical equipment or software, which can lead to errors in diagnosis and treatment), non-compliance with standards (violations of medical standards and clinical protocols can create risks for patients).

Preserving the confidentiality of medical data means protecting information about a patient's health from unauthorized access, which is guaranteed by law. Confidentiality is ensured by: restricted access to medical data (even in electronic systems), which is granted only to doctors who directly treat the patient and specialists to whom the patient has been referred; access control: the medical institution appoints a limited number of persons who have the right to enter information into electronic systems; anonymity: when using medical information for training or research, the patient must be anonymous; data protection: encryption must be used in accordance with legal requirements when transferring and storing personal and medical information.

An important aspect of management is ensuring the reliability, timeliness and transparency of information provided to participants in the healthcare system. A modern electronic health system (e-Health) makes it possible to unite all stakeholders in the healthcare system, forming a single central management mechanism that ensures effective collection and consolidation of clinical data, access to medical services, digital prescriptions, electronic medical records, online consultations, etc.[26] The key challenges of the process are seen as the complexity of standardizing and unifying medical documentation in different organizations; the need to support cybersecurity and guarantee privacy protection; and the resistance of participants in the process of providing medical services to innovations.

Public governance in the area under study includes the functioning of central and regional bodies, which are tasked with forming sectoral state policy and ensuring its implementation in a certain territory. At the central level, the process of forming sectoral state policy, adopting regulations, establishing financing and other functions defined by current legislation takes place.[27] At the same time, at the regional level, the organization and provision of medical services takes place, which includes primary, specialized and emergency care, preventive measures, licensing, as well as other types of services.

The terms of PPPs in healthcare include defining common goals, pooling resources, and sharing risks, responsibilities, and rewards between the government and private partners. Precautionary measures include clear contracts that regulate the rights and obligations of the parties, maintaining the availability and quality of medical services for patients, as well as transparency of processes and control over the fulfillment of conditions. Precautionary measures to protect patient rights:

- Contractual terms: All obligations, rights, and responsibilities of the parties, as well as the procedure for providing services, must be clearly spelled out in the healthcare contract.
- Maintaining accessibility of services: It is necessary to ensure that PPPs do not lead to a reduction in the accessibility of medical services for the population, especially for vulnerable groups.
- Quality control: Mechanisms must be put in place to control the quality of services provided in order to ensure compliance with treatment standards and protocols.
- Transparency: The process of selecting a private partner, concluding contracts, and implementing projects must be as transparent and understandable to the public as possible.
- Protection of patient rights: The rights of patients must be guaranteed, including the right to choose a doctor and medical facility, confidentiality of information, etc.

PPPs are contractual arrangements between a public authority and a private partner that aim to leverage private capital, expertise and operational efficiency to deliver public healthcare infrastructure and services. Typical PPP models include Design–Build–Finance–Operate (DBFO), Managed Services and Performance-Based Outsourcing. In DBFO, the private partner assumes responsibility for the design, financing, construction and operation of a facility, such as a new hospital, while the public sector provides regulatory oversight. Managed services involves engaging private entities to deliver specific healthcare services according to established performance criteria. Performance-based outsourcing links compensation to measurable outcomes (e.g. quality and accessibility indicators), aligning the interests of the public and the private provider. These models involve risk sharing: DBFO transfers financial and construction risks to the private sector, while performance-based outsourcing transfers quality risk to the private partner through a system of performance-related incentives. A typical risk allocation matrix includes financial risk (government funding guarantees versus private equity risk), service quality risk (government standards versus private partner operational performance), and regulatory risk (government oversight) (Table 3).

In practice, PPP contracts should clearly define KPIs–including availability, quality, cost-effectiveness, and timeliness of service delivery – to ensure transparency and accountability.

In Ukraine, the implementation of PPP in the healthcare sector is at an advanced stage, in particular thanks to the support of the PPP Agency, which prepares and promotes investment projects in various sectors, including healthcare. One of the current projects

Table 3 | Risk allocation matrix in PPPs

Risk Category	Public Authority	Private Partner	Commentary
Financial Risk	Guarantees and subsidies	Capital financing and cost control	DBFO shifts most funding risk to private partner
Service Quality	Standard setting and monitoring	Operational compliance	Performance key performance indicators (KPIs) enforce quality targets
Regulatory Risk	Policy, compliance, licensing	Contractual adherence	Clear contractual terms minimize disputes
Operational Risk	Infrastructure readiness	Daily management	Requires robust oversight mechanisms

Source: Developed by the author based on.[28]

involves the construction and operation of a new multi-specialty hospital in Lviv under a model where a private investor finances, designs, builds, equips and maintains the facility, while public health services are provided through the consolidated resources of existing hospitals. This model aims to improve accessibility (a wider range of services in the region), quality (modern infrastructure and diagnostics), cost-effectiveness (risk sharing between public compensation and private payment), and timeliness (reduction of waiting times after construction).[29]

Another example is the Ukrainian Center for Tomotherapy (TomoClinic) in Kropyvnytskyi, which, although a private oncology facility, demonstrates how advanced medical technologies (e.g. TomoTherapy® HD) can be integrated into national healthcare pathways through collaboration between public health services and private funding. Performance indicators include increased daily radiotherapy throughput (access), treatment outcomes and patient satisfaction (quality), treatment costs per patient compared to alternatives (cost), and reduced waiting times for diagnostic and therapeutic services (time to service).[30]

As Ukraine's institutional framework develops, the adoption of PPP legislation in 2025 expands opportunities for private sector participation in infrastructure projects, reflecting global practice where PPPs are used to mitigate budget constraints and improve healthcare outcomes through risk sharing and performance-based contracts.

Examples of PPP projects in medicine in Ukraine include the Ukrainian Center for Tomotherapy, the creation of modern rehabilitation centers, the modernization and construction of hospitals, and the introduction of new medical services. These projects are aimed at improving the quality and accessibility of medical services by combining the resources of the state and private business.

Most modern researchers, including Mergel et al.,[31] Paul et al.,[32] see one of the most effective means of optimizing the healthcare sector as the active use of digitalization tools in the public administration system. Time constraints, resource support, and staff qualifications often act as determining factors for the level of quality of digitalization, and therefore, only a small number of healthcare institutions are currently actively integrating technological and managerial innovations. The features of the further development of the technical architecture of the electronic health care system within public administration should include adaptability and flexibility, service orientation, and inclusive development of information and communication tools intended for different categories of users.

Public governance in the health sector is actively expanding its scope of operation, becoming an effective tool for providing the population with high-quality and affordable medical services. The formation of a modern management paradigm in the industry should include strategic management mechanisms, psychological and socio-economic methods of influence, which, in synergy, increase the quality and accessibility of medical services. The transformation of the studied branch of public administration can take place more intensively if successful practices of developed countries are involved, global trends in solving personnel problems are taken into account, as well as intra-system problems.

It is also necessary to emphasize the importance of public control over the legality and effectiveness of administrative activities. Guarantees of transparency and publicity in the medical sector should be provided, including by public organizations and their associations, which will contribute to greater involvement of citizens in administrative processes. The state should provide the appropriate prerequisites: stimulate the activities of local public councils, conduct information and educational activities. At the same time, it is worth noting that control by state bodies and public organizations should be carried out while maintaining the vertical of management.

Based on the above, it is possible to predict an increase in the influence of public administration on the quality and accessibility of a wide range of medical services, including through the implementation of digital optimization solutions. The key strategic objectives for improving public administration in the area under study should be:

1. The pursuit of a "healthy" state policy, which involves ensuring a clear political orientation towards preserving and strengthening the health of society, guarantees of unhindered and equal access of different social categories to high-quality and timely medical care;
2. Combating adverse environmental conditions and implementing the principles of corporate social responsibility;

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3. Focusing efforts on overcoming the gap in the provision of medical care across social classes, overcoming or minimizing inequality;
4. Positioning the population as the country's main capital, providing practical support for its harmonious development;
5. Reorienting the healthcare sector towards preventive medicine, integrating the concepts of health preservation and prevention policy;
6. Positioning the nation's health as basic social capital.

WHO manages health systems through regulatory activities and technical cooperation. Regulatory activities include developing standards and recommendations, while technical cooperation is carried out through regional and country offices to support national health systems in addressing pressing issues such as combating pandemics, non-communicable diseases, and improving access to quality healthcare.

The OECD's activities in the field of health include analyzing and comparing health systems (the OECD conducts comparative studies to identify best practices and develop recommendations for member countries to help them improve their health systems)[33] developing health policies and standards aimed at improving the quality, efficiency, and accessibility of health services, researching innovations, and collecting and analyzing statistical data from member countries on health care costs, population health indicators, service accessibility, etc.[34]

Active reform of healthcare in the context of the growing share of private practice, optimization of financing and patient logistics between individual healthcare sectors does not exclude a number of problematic issues related to the management of healthcare facility personnel, in the context of general digitalization and the need to ensure the inclusiveness and accessibility of medical services. The creation of electronic document management systems and the formation of a national observatory of human resources will not only allow for the effective collection, accumulation, and processing of informative data, but also provide a system to support management decision-making.

In particular, the modern ECHS in Ukraine (e-Health) allows all stakeholders in the healthcare system to be brought together, forming a single central management mechanism that ensures the effective collection and consolidation of clinical data, access to medical services, digital prescriptions, electronic medical records, online consultations, etc. An important aspect of management is ensuring the reliability, timeliness, and transparency of information provided to participants in the healthcare system.

The formation of a modern management paradigm in the industry should include strategic management mechanisms, psychological and socio-economic methods of influence, which in synergy improve the quality and accessibility of medical services. The transformation of the public administration sector under study can proceed more intensively if successful practices from developed countries are applied and global trends in solving personnel problems and internal system problems are taken into account. The development of a digitalised register of industry specialists, the prolongation of medical training and education, and cooperation with international organisations will enable a phased transition to an optimal system of medical staffing in the healthcare system.[35]

The NSZU manages the Medical Guarantees Programme, which finances medical services.[36] The ESOZ is used to work with patients' medical information, which requires compliance with the requirements of the Law of Ukraine "On the Protection of Personal Data." All operations in the system, including cybersecurity, must comply with established rules that protect patients' rights.[37] In this area, institutional support is aimed at reforming the financial support of the healthcare sector,[38] as well as planning the recovery of the industry.[39]

The state of interoperability in Ukrainian healthcare is based on the ECHS, which is a centralized database that allows medical data to be exchanged between different institutions and private information systems. This system is designed to improve the efficiency of medical care, making it more personalized and accessible, although full interoperability has not yet been achieved and depends on the implementation of standards and staff training.

To compare healthcare models in different countries, Germany (social market economy), the United Kingdom (NHS public system), Canada (mixed system), and Australia (mixed system) can be highlighted as examples with clearly defined criteria. Germany uses a management structure based on compulsory social insurance, while the United Kingdom uses public funding through taxes. Canada and Australia combine public and private funding, with different approaches to management and service delivery, as well as different levels of digital maturity, data protection, and private sector involvement (Table 4).

However, the successful functioning of Electronic Health Records (EHRs) is only possible if clear standards are followed. Among the main international standards that ensure the compatibility and functionality of EHRs, HL7 and FHIR stand out. HL7 defines the rules for the exchange of medical data between systems, ensuring their integration regardless of architecture or manufacturer. FHIR, focused on modern digital solutions, simplifies integration through APIs, allowing systems to be quickly adapted to user needs. DICOM standards for working with medical images and ICD for classifying diagnoses are also widely used. At the same time, data privacy is regulated by laws such as GDPR in Europe and HIPAA in the US, which set strict requirements for the storage and processing of personal information.

However, the implementation of EHRs faces numerous challenges. One of the main problems is ensuring data security. Medical information is extremely sensitive, and leaks or misuse can have serious consequences. To prevent cyber threats, it is necessary to implement modern encryption technologies, regular system checks, and data access control. Another challenge is

Table 4 | Comparative table of healthcare models

Criterion	Germany	United Kingdom	Canada	Australia
Management structure	Decentralized, based on social insurance (solidarity funds)	Centralized, public system (NHS)	Decentralized, funded by the federal government, but managed at the provincial level	Decentralized, mixed, federal, and state responsibility
Funding	Compulsory social insurance, employer and employee contributions	Total taxation (tax revenues)	Tax revenues (federal and provincial)	Mixed: public funding (Medicare) and private insurance
Digital maturity	It is growing, digital prescriptions and electronic health records are being implemented, but there are significant differences between regions and insurance companies	The introduction of electronic medical records and online appointments is gaining momentum, but there are problems with system integration	Different levels in provinces, some provinces have developed digital platforms, others lag behind	Progress is being made, digital health records are being implemented (My Health Record), online services, but data integration remains a challenge.
Data protection modes	Strict rules in accordance with the General Data Protection Regulation (GDPR), but there are specific rules for medical data	Strict regulations in accordance with the GDPR and the UK Data Protection Act	A complex system that depends on provincial laws, but there are general federal data protection principles	Complies with international standards, but there are differences between states and provinces
DPP mechanisms	Moderate use, mainly in rehabilitation and long-term care, but there are significant differences between regions and insurance companies.	Limited use, mainly in the field of additional services or in specific medical institutions	Limited use, mainly in the field of equipment procurement and infrastructure management	Active use, especially in infrastructure, hospital construction, and support services

Source: Developed by the author.

the high cost of implementing EHRs, which includes not only software development but also infrastructure upgrades and staff training. Integrating existing systems also remains a difficult task, as many healthcare facilities use outdated platforms that are incompatible with new solutions. Staff training requires additional resources and time, as healthcare professionals must master new skills in working with digital tools. In addition, maintaining the stable operation of EHRs requires regular software updates and monitoring of its effectiveness. Despite these difficulties, the prospects for the development of EHRs are impressive. In the future, their functionality is expected to expand through integration with AI for analyzing large amounts of data and predicting disease risks. The use of cloud technologies will simplify information storage and provide access to it from any device. Mobile applications integrated with EHRs will allow patients to independently monitor their health and receive recommendations in real time. Such innovations will facilitate the transition to personalized medicine, where treatment will be tailored to the individual needs of patients. Electronic medical records are one of the most important tools for the digital transformation of medicine. Their implementation not only improves patient care but also optimizes the work of medical institutions. In particular, centralizing data in digital form facilitates interaction between doctors of different specialties, promotes greater patient awareness of their health status, and provides the ability to integrate with other digital tools, such as telemedicine or mobile health applications. 45 Integrating EHRs with AI opens up new opportunities for data analysis. For example, machine learning algorithms can use patient records to create individual disease predictions or select the optimal treatment. AI also helps automate routine tasks, such as verifying that prescribed treatments comply with clinical protocols, which reduces the risk of errors. Cloud technologies are another important aspect in the development of EHRs. They provide scalability and data accessibility, which is especially relevant for large medical systems or national health programs. The use of cloud solutions can significantly reduce infrastructure costs while ensuring a high level of data security thanks to modern encryption protocols. Such services also promote mobility, allowing doctors and patients to access information from anywhere in the world.

It is worth noting that in parallel with the implementation of the Law of Ukraine "On State Financial Guarantees of Medical Care of the Population" dated 19.10.2017 No. 2168-VIII,[40] the transition to an electronic health care system (ESOZ/ECHS or eHealth) continued on the basis of the Resolution of the Cabinet of Ministers of Ukraine dated April 25, 2018 No. 411 "Some Issues of the Electronic Health Care System,"[41] which allowed for more effective control over medical services. ESOZ/ECHS is a two-level information architecture that ensures the integration and interaction of users through MIS with a central database (CDB). This system includes two main components: the CDB, which acts as a centralized hub for storing and processing medical data, and the MIS, which act as an interface between the user and the CDB (Figure 3). Access to the CDB is provided only to authorized MIS and users, which ensures the necessary level of protection and confidentiality of information. To connect an MIS to the ESOZ/ECHS database, its owner must submit a request to the database administrator (SE "Electronic Health") and confirm that the system's functionality meets the technical requirements approved by the National Health Service.

As of 2024, more than 35 MIS integrated into the ESOZ/ECHS are operating in Ukraine and are connected to the database. MIS actually act as "doors" or "bridges" that provide access to users (medical professionals and patients) to data in the CDB (Figure 4). The ESOZ/ECHS architecture provides centralized storage and processing of medical information, and MIS is the necessary user interface for effective interaction with data.

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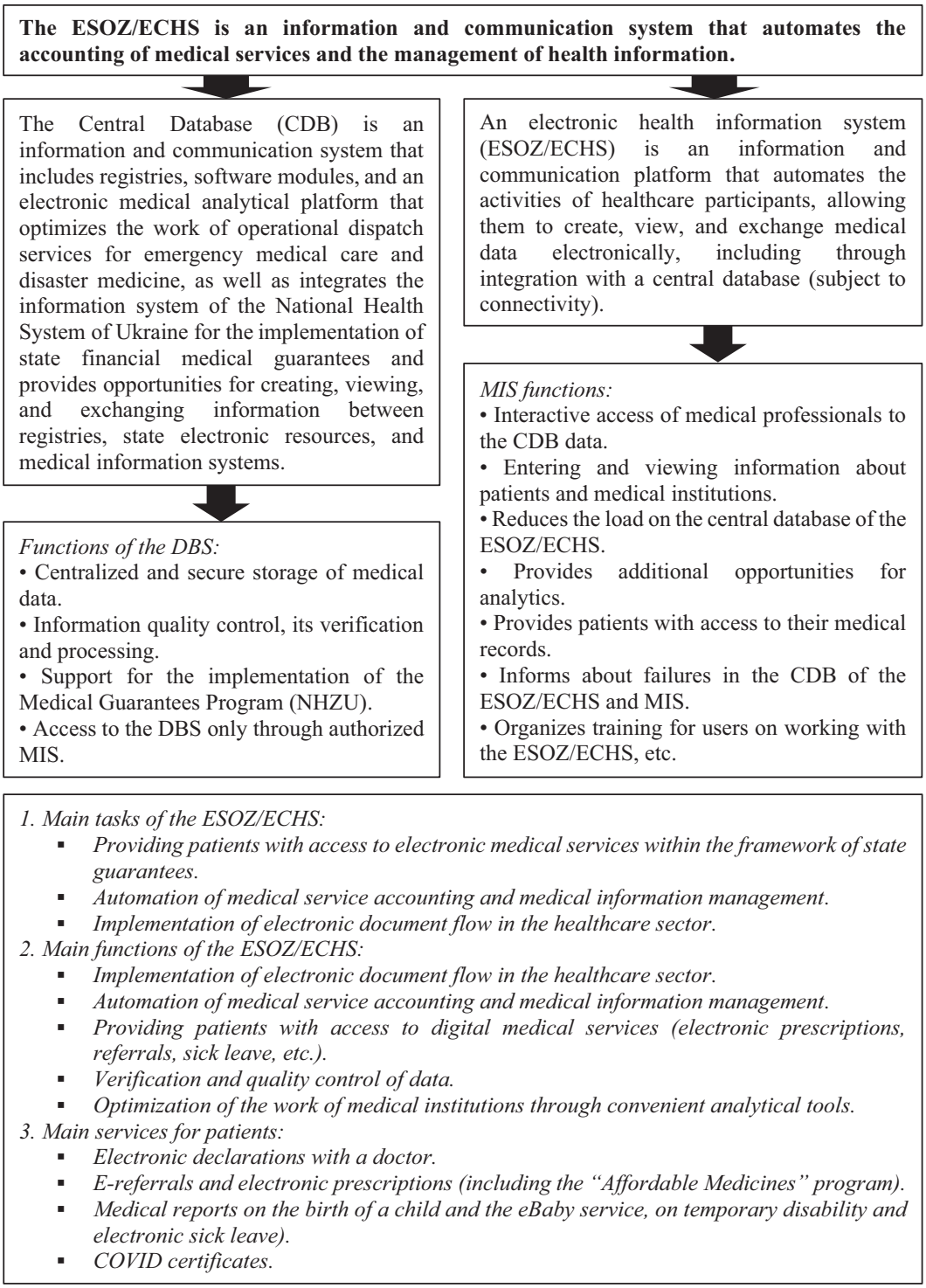

Fig 3 | Structure and main tasks of the ESOZ/ECHS
Source: Developed by the author based on[42]

To ensure interoperability, international standards for the exchange of medical information are used, in particular:[43,44]

- HL7 v2 and FHIR – for the exchange of clinical data and management of resources such as Patient, Encounter, Observation;
- DICOM – for the exchange of medical images;
- IHE profiles (XDS.b, MHD, ATNA) – to ensure interoperability and secure exchange of electronic health records between different institutions and systems.

Within the framework of the ESOZ/ECHS, a clear data governance model is applied, which provides for the definition of the roles of Data controller (NHZU)

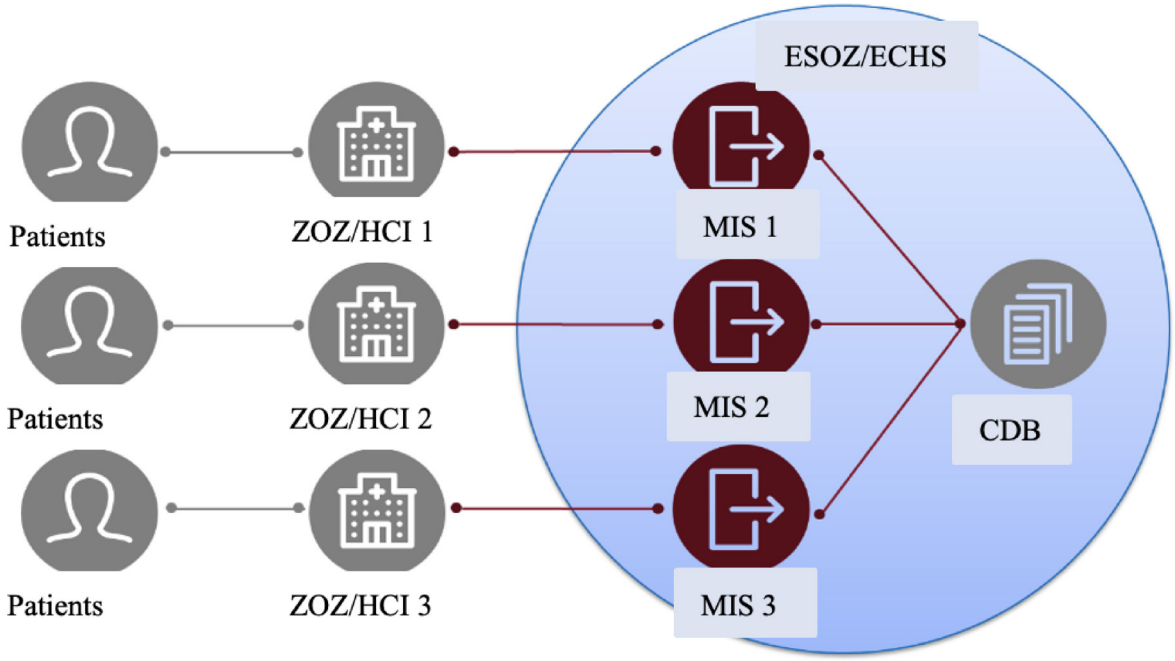

Fig 4 | Two-level architecture of the ESOZ/ECHS
Source: Developed by the author based on[42]

and Data processor (MIS, medical institutions). Personal data is processed in accordance with the legislation of Ukraine on personal data protection and GDPR norms, in compliance with the principles of: lawfulness of data processing and data minimization; clear patient consent models (opt-in/opt-out); data storage and access restrictions; conducting a privacy impact assessment (DPIA) in case of high risk; control of cross-border data transfers.

To ensure cybersecurity and data protection, the STRIDE threat model and corresponding controls are used in accordance with the NIST CSF 2.0, ISO 27001/27002, ISO 27701 standards. The main measures include: auditing and logging of user actions; monitoring and incident management; privacy-preserving analytics for analytics without violating confidentiality; regular vulnerability testing and risk assessment.[23,24,45]

Thus, the integration of data exchange standards, a clear information management model, and systemic cybersecurity measures ensure the reliability and effectiveness of the ECHS of Ukraine, which is a key element of the reform of the secondary level of public health care and the transition to a model of financing for actually provided medical services.

The main regulatory acts in the field of PPP in healthcare are the Law of Ukraine "On Concessions," the Law of Ukraine "On Public Electronic Registers," and other laws related to the healthcare system. In addition, at the level of subordinate legislation, there are resolutions of the Cabinet of Ministers of Ukraine and orders of the Ministry of Health (MOH) regulating specific aspects of the functioning of the ECHS, the maintenance of patient registers, medical records, referrals, and the choice of doctor.

Mapping Ukraine's Healthcare Governance Reforms to the WHO Building Blocks Framework

Table 5 demonstrates the comprehensive reform of the Ukrainian healthcare system in the context of the six blocks of the WHO health system, reflecting key changes, results and regulatory frameworks. The reforms cover structural, financial and digital aspects aimed at improving the efficiency, accessibility and quality of health services. In the area of service provision, financing based on declarations and contracts, electronic referral systems, prescriptions and medical records were introduced, which allowed to optimize the work of institutions and increase accessibility for the population, although significant barriers remain in the context of war and destruction of infrastructure. Regarding staffing, initiatives include the creation of a single web portal for vacancies, the involvement of psychiatrists in mandatory examinations and mandatory vaccination of health workers. However, problems remain: staff attrition and a shortage of specialists in the regions. Reforms in the field of information systems (eHealth, eStock, MedData, Diia.Engine) have ensured data integration and operational control, although incomplete digitalization and limited inter-institutional communication limit efficiency. In financing and access to medicines, transparency and efficiency of resource allocation have increased. The autonomy of institutions under the control of the National Health Service of Ukraine stimulates accountability, but the centralization of payments through the State Health Service of Ukraine and logistical difficulties in crisis zones limit flexibility. Leadership and management have strengthened strategic planning, regulatory control, and integration of international standards. Increasing the role of prevention, digitalization, and adaptation to

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modern challenges emphasize Ukraine's aspiration for a sustainable and effective healthcare system.

Overall, the reforms implemented form a systemic strategy for healthcare development, while unresolved problems remain that require targeted political and managerial solutions.

The matrix shows the strengths and weaknesses of the Ukrainian healthcare system compared to other countries (Germany, UK, Canada) in key WHO domains. Ukraine has significant advantages in the development of electronic healthcare systems (eHealth, EHR), the development of HRMIS and the expansion of telemedicine. At the same time, structural gaps are observed: fragmented accountability, staff shortages, burnout, limited availability of services and interruptions in the supply of medicines.

A comparison with Germany, the UK and Canada demonstrates that these countries are characterized by a high level of governance, effective staff training systems, integrated digital platforms and stable financing. It is advisable for Ukraine to adapt such practices as increasing data integration (interoperability), developing professional training and retraining of staff, implementing effective financing mechanisms and standardized digital processes in the field of medicines (Table 6).

Thus, the matrix allows us to identify priority areas of reform within each WHO domain and to form specific policy levers that will contribute to increasing the efficiency, transparency, and accessibility of the Ukrainian healthcare system.

Despite the active implementation of electronic services and the development of HRMIS, Ukraine still experiences significant problems in the field of health care management, especially in terms of coordination, integration of services and ensuring sustainable

Table 5 | Mapping of Ukraine's Healthcare Governance Reforms to the WHO Health System Building Blocks: Reform Elements, Outcomes, and Regulatory Framework

WHO Health System Building Block	Key Reform Elements in Ukraine	Outcomes/Observed Changes	Relevant Normative Acts and Evidence
1. Service Delivery	• Financing of primary healthcare based on patient-doctor declarations • MGP • Electronic referrals, prescriptions, COVID-19 certificates • Implementation of electronic queues and patient records system • Transformation of healthcare institutions into communal non-profit enterprises	• Improved accessibility of primary healthcare services • Optimized patient routing • Reduced queues and chaotic access • Limited access in conflict-affected regions • Overload of medical institutions during wartime	• Law of Ukraine "On State Financial Guarantees of Medical Services for the Population" №2168-VIII, 19 October 2017 • MOH of Ukraine Order "On Approval of the Procedure for Verification of Accuracy of Information and Documents Entered into the ECHS" №807, 19 July 2022 • Concept of Healthcare Financing Reform
2. Health Workforce	• Launch of the unified healthcare job portal • Inclusion of psychiatrists in mandatory medical examinations • Vaccination of personnel working in high-risk areas • Challenges of workforce shortage and migration	• Increased personnel safety • Transparency of job vacancies and staffing • Outflow of qualified medical staff • Shortage of specialists in frontline and remote regions	• MOH of Ukraine Order "On Amendments to the Order on Mandatory Medical Examinations" №2002, 24 November 2023 • Health System Development Strategy of Ukraine until 2030
3. Health Information Systems	• Electronic Healthcare System (eHealth) • e-Stock and MedData systems for resource and inventory management • "Diia.Engine" platform and personal patient account • New modules for electronic patient data management	• Improved digital integration of healthcare services • Better control of medicine stocks • Faster access to medical data • Technical failures and incomplete electronic documentation • Limited inter-institutional integration	• MOH of Ukraine Order "On the Organization of a Working Group on the Creation of the Public Health Information Platform" №1409, 9 August 2024 • Concept of eHealth Development in Ukraine
4. Access to Essential Medicines	• "Affordable Medicines" Program • Control of medicine stocks via eStock • Automation of logistics and inventory management	• Increased transparency in medicine circulation • Improved access to essential drugs • Supply interruptions in conflict zones • Limited access due to logistical challenges	• MGPeStock system
5. Health Financing	• Mechanism of targeted financing from the state budget as medical subvention • Activity of the National Health Service of Ukraine as the state purchaser • Autonomy of healthcare institutions and contract-based financing under "money follows the patient" principle	• Increased financial autonomy of institutions • Enhanced transparency in funding • Resources allocated more efficiently • Unequal financing in crisis conditions • Restricted strategic planning due to centralized payments via the State Treasury Service	• Law of Ukraine "On State Financial Guarantees of Medical Services for the Population" №2168-VIII, 19 October 2017 • Cabinet of Ministers of Ukraine Resolution "On Approval of the Procedure for Verification of Accuracy of Information and Documents in the ECHS" №807, 19 July 2022
6. Leadership & Governance	• Health System Development Strategy of Ukraine until 2030 • Law of Ukraine "On the Public Health System" • Presidential Decrees on healthcare development and increasing competitiveness of medical institutions	• Strengthened strategic planning and public health governance • Increased transparency of regulatory mechanisms • Complexity of implementing reforms during wartime • Need for rapid adaptation in crisis conditions	• Health System Development Strategy of Ukraine until 2030 • Law of Ukraine "On the Public Health System" №1907-IX, 6 December 2019 • Presidential Decree №369, 18 August 2021; Presidential Decree №261, 18 June 2021

Source: Developed by the author based on.[39,40–51]

Table 6 | Governance mapping matrix for Ukraine and comparator countries

WHO Domain	Ukraine – Strengths	Ukraine – Gaps	Comparator Countries (Germany, UK, Canada)	Dependencies	Near-Term Policy Levers
Leadership & Governance	eHealth strategy; wartime coordination structures	Fragmented accountability; limited regulatory coherence	UK – centralized NHS governance; strong policy coordination	Donor funding; wartime risks; political stability	Strengthen regulatory coherence; establish clear lines of accountability; enhance crisis response coordination
Health Workforce	Development of HRMIS (Human Resource Management Information System)	Workforce shortage; high burnout rates; uneven distribution	Germany – robust vocational training and workforce planning	Education financing; workforce retention	Implement digital HR registry; continuous professional development (CPD) reforms; targeted recruitment in underserved regions
Health Information Systems	Expansion of eHealth, EHRs, telemedicine	Fragmented IT systems; legacy platforms; low interoperability	Canada – nationally integrated health information systems; strong interoperability standards	IT infrastructure; data security	Enforce HL7 FHIR standards; expand EHR adoption; promote interoperability and data sharing
Service Delivery	Telemedicine expansion; community health initiatives	Uneven geographic access; limited integration across levels of care	UK/Canada – integrated care pathways; community-focused delivery	Local capacity; infrastructure	Develop integrated care pathways; scale telemedicine; strengthen primary care networks
Financing	NHSU reforms; budgeting frameworks	Insufficient sustainable financing; reliance on emergency funding	Germany – robust health insurance system; stable macroeconomic support	Macro stability; fiscal capacity	Introduce performance-based financing; long-term budget planning; align funding to outcomes
Access to Medicines	e-Prescription implementation	Supply chain disruptions; logistics limitations	EU – well-regulated pharmaceutical distribution; digital tracking	Logistics; regulatory environment	Implement digital tracking systems; improve procurement and supply chain resilience

Source: Developed by the author based on.[52–61]

financing. For comparison, in the UK, the NHS has a centralized management system that provides unified coordination and quality control of services; in Germany, a strong system of professional training and personnel planning allows us to maintain a high level of competence and distribution of medical personnel; Canada demonstrates a high level of integration of information systems and standardization of electronic medical records, which allows us to ensure reliable interaction between different levels of medical care.

Comparative analysis shows that Ukraine has the opportunity to adapt a number of practices: centralized coordination at the regional level (as in the UK), standardization of information systems and implementation of a national integrated EHR platform (as in Canada), as well as the development of professional training and a CPD system for healthcare professionals (as in Germany).

Governance of AI in Healthcare Systems: The EU and Ukraine Experience

The EU defines the development of AI through the concept of excellence and trust, combining the promotion of innovation with the provision of security and respect for fundamental rights. The EU AI Act introduces four levels of risk for the use of AI: minimal, limited, high and unacceptable. In healthcare systems, especially in clinical decision support systems (CDSS), AI is usually classified as high risk due to the potential impact on diagnosis, treatment and patient safety.

To ensure the safety and reliability of AI systems, the following are used:

- Validation of models against clinical standards and real-world data;
- Monitoring the performance and accuracy of models in a real-world environment;
- Bias Assessment to identify discriminatory or unequal outcomes;
- Explainability, which allows doctors and patients to understand the logic of the model's decisions.

Effective use of AI involves careful data governance:

- Using reliable sources ("ground truth") and verified clinical data;
- Tracking the origin and transformations of data (data lineage);
- Clearly defining the roles of the controller and data processor in accordance with GDPR and Ukrainian legislation;
- Using open consent mechanisms and respecting patients' rights.

Table 7 shows the risk levels of AI applications in healthcare systems, according to the EU AI Act classification. Low-risk systems do not directly affect patient health and require minimal monitoring. Medium-risk systems can support clinical decisions but leave ultimate control to the physician. High-risk systems, such as diagnostic or personalized recommendation AI models, require comprehensive validation, ongoing monitoring and assessment of bias, and explainability. Unacceptable systems are prohibited from use due to the high potential risk to patients. Additionally, data governance in all cases requires compliance with GDPR and national laws, open user consent, and transparency in data processing.

Ukraine is actively integrating EU practices in the field of AI. On October 4, 2025, Ukraine participated for the first time in a high-level meeting of the European AI Board, where the team of the Ministry of Digital Transformation was represented. Participation in the observer status granted by the European Commission

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Table 7 | Classification of AI risks in healthcare systems

Risk Level	Examples of AI Systems	Key Management Measures
Low	Administrative planning, resource allocation	Minimal monitoring, algorithm transparency
Medium	Patient flow forecasting, warning notifications	Regular validation, auditing, partial physician participation
High	Diagnostic systems, personalized recommendations	Mandatory validation, continuous monitoring, bias assessment, explainable AI, strict data management rules
Not Acceptable	Autonomous systems for life-critical decisions without human intervention	Prohibited under the EU AI Act

Source: Developed by the author based on[62,63]

allowed to participate in the formation of a common AI policy and the discussion of the national adaptation of the AI Act.

The information presented included:

1. Progress in the implementation of the White Paper on AI and the implementation plans of the AI Act together with EU4 Digital;
2. Development of the National AI Strategy until 2030, the launch of the AI assistant in "Diya", tools for European integration and a large language model;
3. The need to create an AI Sandbox and strengthen regulatory institutions;
4. The desire to join the EuroHPC JU.

This approach allows Ukraine to move closer to European standards, ensuring the safe use of AI in telemedicine and clinical decision support systems, with mandatory model control, data audit and compliance with the GDPR and Ukrainian legislation.

Conclusion

As the results of the study show, public administration in the healthcare sector is assigned one of the main roles in national policy. The efforts of public administration in the medical sector should be aimed at improving the quality and accessibility of medical services for all segments of society. The actualization of openness and publicity factors plays a significant role in strengthening the position of health care institutions, optimizing social communications, and increasing public involvement.

The introduction of cutting-edge electronic systems and technologies to optimize the medical system is one of the most significant industry reforms. However, this comes with security challenges for the healthcare system in the information environment (protection of confidential data, prevention of unauthorized access, and ensuring the integrity of information resources). The introduction of effective information systems and innovative capabilities of digitization and AI, the creation of electronic document management systems, and the formation of a national human resources observatory allow not only to effectively collect, accumulate and process informative data, but also to provide a system to support management decision-making. The development of a digitized register of industry specialists, the extension of education and training of doctors, and cooperation with international organizations will allow for a gradual transition to an optimal system of medical staff ratios in the health care system.

The research demonstrates that PPP projects in the healthcare industry enable substantial service quality optimization and expansion, integration of worldwide quality standards, and assurance of medical care accessibility. The synergy of a professional approach and stable principles of implementing the strategic goals of healthcare reform, proper control by the state and society will increase the efficiency of public administration in the healthcare sector.

Promising scientific developments on the topic of the current research should be aimed at finding ways to improve and update state management policy in the field of healthcare, in accordance with the challenges of digital transformation.

List of Abbreviations

AI: Artificial Intelligence
ATNA: Audit Trail and Node Authentication
CDB: Central Database
CPD: Continuous Professional Development
DBFO: Design–Build–Finance–Operate
DICOM: Digital Imaging and Communications in Medicine
EHR: Electronic Health Record
EHS: Electronic Health System
ECHS: Electronic Healthcare System
ESOZ: National Electronic Healthcare Architecture
FHIR: Fast Healthcare Interoperability Resources
GDPR: General Data Protection Regulation
GHSI: Global Health Security Index
GDHI: Global Digital Health Index
GDHM: Global Digital Health Monitor
HCI/ZOZ: Health Care Institution
ICD: International Classification of Diseases
HRMIS: Human Resource Management Information System
KPI: Key Performance Indicator
MGP: Medical Guarantee Program
MIS: Medical Information System
MOH: Ministry of Health
NHS: National Health Service
NSZU: National Health Service of Ukraine
PPP: Public-Private Partnership
SIU: Scheduling Information Unsolicited
STRIDE: Spoofing, Tampering, Repudiation, Information Disclosure, Denial of Service, Elevation of Privilege
WHO: World Health Organization
XDS.b: Cross-Enterprise Document Sharing
MHD: Mobile Health Document

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Appendix

Table A1 | Characteristics of included studies and quality appraisal

Study	Country/Scope	Study Design	Population/Sample	Key Focus	Key Findings	Quality Appraisal (JBI/MMAT/CASP)
Wang et al.[1]	Ukraine	Empirical	Healthcare systems	AI, privacy-preserving federated learning	Framework for secure AI in healthcare	High (JBI)
Zeeshan et al.[2]	Comparative (Ukraine + others)	Empirical	Health systems, clinicians	AI, multi-functional ML platforms	Precision medicine improvement	Moderate (MMAT)
Madan and Ashok[3]	Comparative	Review	Public administration	AI adoption & diffusion	Integration of AI in public admin	High (CASP)
Simonet[4]	France	Case study	Hospitals	New Public Management	Assessment of NPM reforms	Moderate (CASP)
Androniceanu[5]	Romania	Policy analysis	Public administration	Transparency & governance	Enhancing democratic governance	High (CASP)
Buljac-Samardzic et al.[6]	International	Systematic review	Healthcare teams	Team effectiveness	Interventions improve collaboration	High (JBI)
Clausen et al.[7]	International	Empirical	Public sector orgs	Innovation intensity	Push/pull factors influence innovation	Moderate (MMAT)
Hasselgren et al.[8]	International	Scoping review	Healthcare organizations	Blockchain in health	Overview of blockchain applications	Moderate (CASP)
Henman[9]	Asia-Pacific	Policy review	Public services	AI in governance	Governance challenges and pitfalls	Moderate (CASP)
Lucifora[10]	Italy	Comparative	Hospitals	Management practices	Public vs private hospital comparison	High (CASP)
Petrigna and Musumeci[11]	International	Scoping review	Healthcare systems	Metaverse applications	Potential in healthcare delivery	Moderate (MMAT)
Reina and Scarozza[12]	Italy	Book chapter/ Review	Public administration	HR management	Organizational development practices	High (CASP)
Khatoon[13]	Pakistan	Empirical	Medical institutions	Blockchain & smart contracts	Improved efficiency & transparency	High (JBI)
Klochan et al.[14]	Ukraine	Policy analysis	National health system	Digital platforms	Strategic consulting transformation	Moderate (MMAT)
Chen et al.[15]	International	Review	Public sector orgs	Public service innovation	Typology of innovation	High (CASP)
Klenk and Reiter[16]	Germany	Review	Social services	Post-NPM reforms	Reform application analysis	Moderate (CASP)
Kraus et al.[17]	International	Review	Healthcare organizations	Digital transformation	State-of-research analysis	High (CASP)
Ahn and Chen[18]	South Korea/ Taiwan	Empirical	Government employees	AI adoption in public admin	Employee perception & willingness	High (JBI)
MacLean and Titah[19]	Canada	Systematic review	E-government users	Public value perspective	Impact assessment of e-government	High (JBI)
Ansell and Miura[20]	International	Policy review	Governance platforms	Platform power for governance	Opportunities & risks	Moderate (CASP)
Farouk et al.[21]	International	Empirical	Healthcare & industry	Blockchain platforms	Future opportunities in healthcare	Moderate (MMAT)
Brunetti et al.[26]	Italy	Multi-stakeholder study	Public & private orgs	Digital transformation strategies	Emerging strategies identified	Moderate (MMAT)
Scupola and Mergel[27]	Denmark	Case study/Review	Public admin	Co-production & digital transformation	Value creation & governance	High (CASP)
Mergel et al.[31]	USA	Policy review	Government orgs	Agile governance	New governing approaches	Moderate (CASP)
Paul et al.[32]	International	Empirical	Healthcare organizations	Digitization, privacy & security	Security risk assessment	High (JBI)
OECD[33]	OECD countries	Report/Statistics	National health systems	Health system indicators	Comparative indicators	High (CASP)
OECD[57]	OECD countries	Report/Statistics	National health systems	Health system indicators	Updates & trends	High (CASP)

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Table A1 | Continued

State Statistics Service of Ukraine[35]	Ukraine	Statistical data	Health care expenditures	Funding analysis	National expenditure overview	High (CASP)
State Statistics Service of Ukraine[36]	Ukraine	Methodology/ Guidelines	National Health Accounts	Accounting methodology	Guidelines for compiling NHA	High (CASP)
National Institute for Strategic Studies[37]	Ukraine	Report/Policy brief	Healthcare resources	Wartime healthcare resources	Resource allocation & recommendations	High (CASP)
WHO[38]	Ukraine	Report/Overview	Health financing	Reform & progress	Policy directions & analysis	High (CASP)
Cabinet of Ministers of Ukraine[39]	Ukraine	Report/Policy document	Healthcare system	Recovery plan	Strategic priorities & actions	High (CASP)

Notes:
• Quality appraisal was conducted using [JBI, MMAT, or CASP] depending on the study design.
• High = meets most quality criteria; Moderate = meets some criteria but with limitations.